Advanced Training course on CROP GROWTH MODELLING AND WATER PRODUCTIVITY FOR ECO-EFFICIENT AGRICULTURAL WATER MANAGEMENT

Practical session on AquaCrop model

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Practical Exercise on PC

Climate file creation

1

Environment
Location: Tal Amara, Bekaa valley, Lebanon
Coordinates: Lat.: 33.856954; Long.: 35.986853; Alt.: 916 m

Assignment
Create an AquaCrop climate file for Tal Amara (Lebanon) for the period 1 November 2016 to 9 May 2019.
Daily climatic data for Tal Amara are available in 'Climate data.xls' including:

- Rainfall (mm)
- Solar radiation (W/m^2)
- Wind speed measured at 2 m height ($m \cdot s^{-1}$)
- Minimum air temperature (°C)
- Maximum air temperature (°C)
- Mean relative humidity (%)

Steps
- Copy the necessary data (without headings and without the first column labeled "Date") from excel to notepad and save the file as Tal Amara.CXT in: C:\..\Desktop\Practical session\AquaCrop v.6.1\IMPORT
- Start AquaCrop.
- Click on 'Climate', then click on 'Select\create climate file'
- Click on 'import/create climatic data'
- Import climatic data from file ("Tal Amara.CXT") and fill in all data describing the station and the meteorological parameters.
- Define the time range and climatic parameters. Then update the data range. You also have to add the coordinates of the meteorological station.

- Import climatic data in separate files (ETo and Temperature and rainfall) in AquaCrop compatible format (Path: C:\..\AquaCrop v.6.1\DATA).
- Click on 'Create climate file' (called "Tal Amara.CLI") and Select the imported files: Tal Amara.ETo, Tal Amara.TMP and Tal Amara.PLU.

  - Click on 'Create climate file'

Files produced (Path: C:\..\AquaCrop\DATA)

Tal Amara.ETo Tal Amara.TMP Tal Amara.PLU Tal Amara.CLI

Practical Exercise on PC

Climate file creation

2

Environment
Location: ElAbdeh, Akkar, Lebanon
Coordinates: Lat.: 34.52083333; Long.: 35.98777778; Alt.: 15 m

Assignment
Create an AquaCrop climate file for El Abdeh (Lebanon) for the period 1 January 2018 to 31 December 2019.
Daily climatic data for El Abdeh are available in 'Climate data.xls' including:

- Rainfall (mm)
- Solar radiation (W/m^2)
- Wind speed measured at 2 m height ($m \cdot s^{-1}$)
- Minimum air temperature (°C)
- Maximum air temperature (°C)
- Mean relative humidity (%)

Steps
- Copy the necessary data (without headings and without the first column labeled "Date") from excel to notepad and save the file as El Abdeh.CXT in: C:\..\Desktop\Practical session\AquaCrop v.6.1\IMPORT
- Start AquaCrop.
- Click on 'Climate', then click on 'Select\create climate file'
- Click on 'import/create climatic data'
- Import climatic data from file ("El Abdeh.CXT") and fill in all data describing the station and the meteorological parameters.
- Define the time range and climatic parameters. Then update the data range. You also have to add the coordinates of the meteorological station.

- Import climatic data in separate files (ETo and Temperature and rainfall) in AquaCrop compatible format (Path: C:\..\AquaCrop v.6.1\DATA).
- Click on 'Create climate file' (called "El Abdeh.CLI") and Select the imported files: El Abdeh.ETo, El Abdeh.TMP and El Abdeh.PLU.

- Click on 'Create climate file'

Files produced (Path: C:\..\AquaCrop\DATA)

El Abdeh.ETo El Abdeh.TMP El Abdeh.PLU El Abdeh.CLI

Practical Exercise on PC

Crop yield assessment (create crop and soil files)

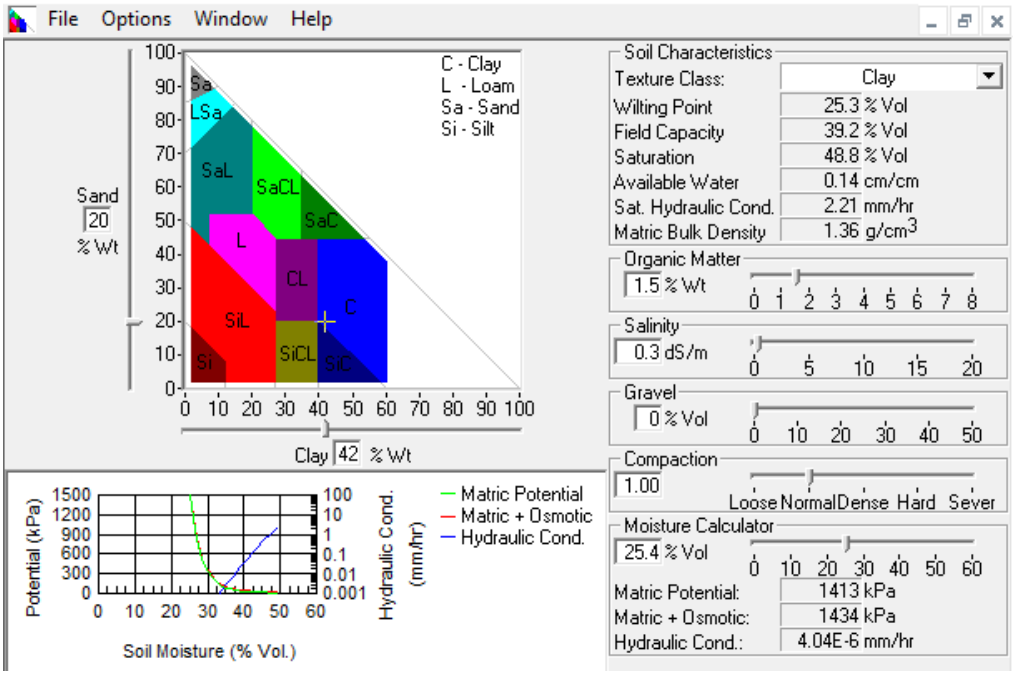
3

Environment

Location: Tal Amara, Lebanon

Assignment

Determine the average wheat yield in the region of Tal Amara for 2016-2017 and 2017-2018 growing seasons. According to local practices, farmers sow wheat at the beginning of the rainy season, assume on 5 November. The wheat variety is characterized by a longer crop cycle than the default FAO wheat file (emergence = 11 DAS, maximum canopy cover = 120 DAS, senescence = 168 DAS, maturity = 210 DAS). In addition, the maximum root depth is 1 m and the maximum canopy cover is 90%. Assess the yield on a local soil of 1.5 m depth with the following characteristics: 42% clay, 38% loam, and 20% sand. This soil has 1.5% organic matter content, it has also an electrical conductivity of 0.3 dS/m. Its compaction is normal.



- Crop: Wheat:

o Emergence = 11 DAS
o Maximum canopy cover = 120 DAS
o Senescence = 168 DAS
o Maturity = 210 DAS
o Maximum canopy cover = 90%
o Maximum root depth = 0.5 m

Save the file as WheatTalAmara.CRO

- Sowing date: 5 November
- Soil: Local soil (with determined textural characteristics) and a depth of 1.5 m

Steps

- Create the necessary crop and soil files
- Create projects in AquaCrop and load the necessary climatic, crop and soil files.

Files required

Tal Amara.CLI
Wheat.CRO (needs to be fine tuned) Tal Amara.SOL (needs to be created)

Files produced (Path: C:\..\AquaCrop\DATA)

WheatTalAmara.CRO TalAmara.SOL WheatTalAmara.PRM

Year	Yield (t/ha)
2016-2017	
2017-2018	

Practical Exercise on PC

Crop yield assessment (create crop and soil files)

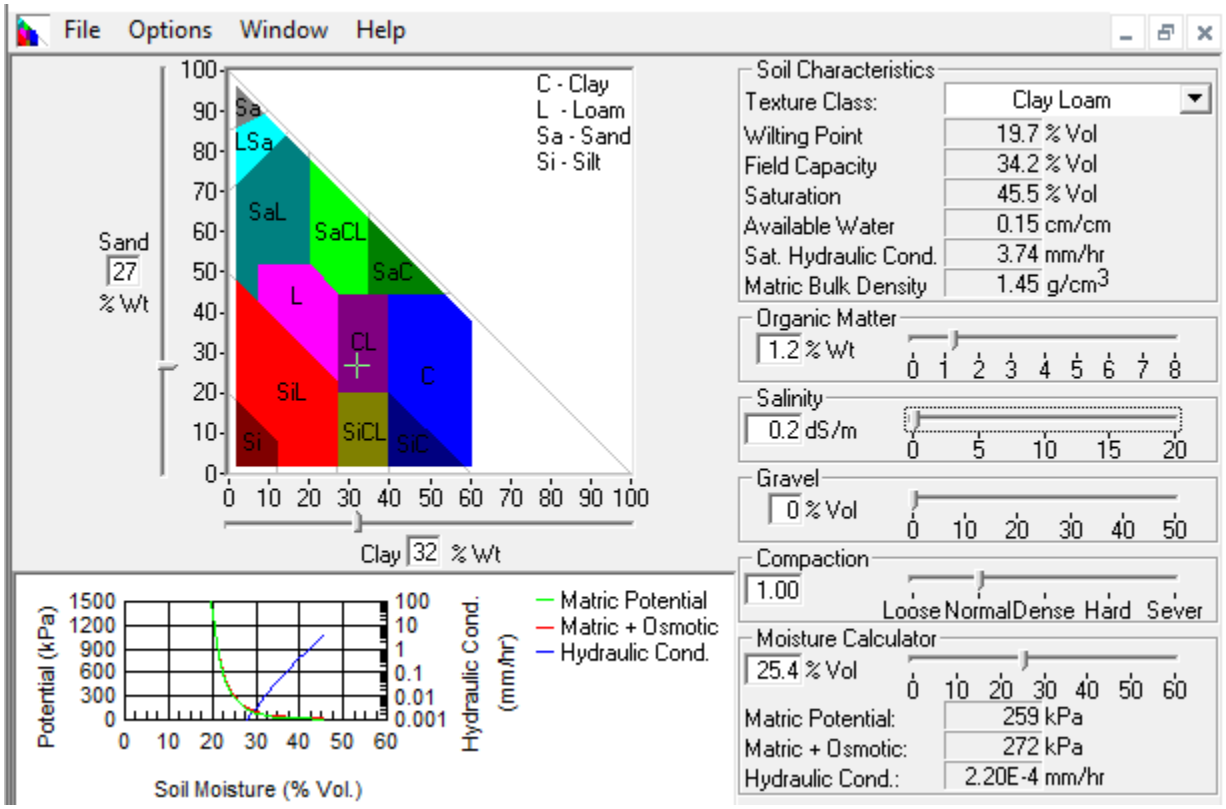
4

Environment

Location: El Abdeh, Lebanon

Assignment

Determine the average potato yield in the region of El Abdeh for 2018 and 2019 growing seasons. According to local practices, farmers sow potato in December-January, assume on 5 January. The potato variety is characterized by a longer crop cycle than the default FAO potato file (emergence = 18 DAS, maximum canopy cover = 59 DAS, senescence = 92 DAS, maturity = 125 DAS). In addition, the maximum root depth is 0.4 m and the maximum canopy cover is 80%. Assess the yield on a local soil of 1.5 m depth with the following characteristics: 32% clay, and 27% sand. This soil has 1.2 % organic matter content, it has also an electrical conductivity of 0.25 dS/m. Its compaction is normal.



- Crop: Potato:

o Emergence = 18 DAS
o Maximum canopy cover = 59 DAS
o Senescence = 92 DAS
o Maturity = 125 DAS
o Maximum canopy cover = 80%
o Maximum root depth = 0.4 m

Save the file as PotatoElAbdeh.CRO

- Sowing date: 5 January
- Soil: Local soil (with determined textural characteristics) and a depth of 1.5 m

Steps

- Create the necessary crop and soil files
- Create projects in AquaCrop and load the necessary climatic, crop and soil files.

Files required

ElAbdeh.CLI
Potato.CRO (needs to be fine tuned) ElAbdeh.SOL (needs to be created)

Files produced (Path: C:\..\AquaCrop\DATA)

PotatoElAbdeh.CRO ElAbdeh.SOL PotatoElAbdeh.PRM

Year	Yield (t/ha)
2018	
2019	

Practical Exercise on PC

Net irrigation requirement

5

Environment
Location: Tal Amara, Lebanon

Assignment
Determine the net irrigation requirement for potato (spunta) in the region of Tal Amara (Lebanon). Assume that the crop is sown on 1 May on a local soil. The potato variety spunta is characterized by a crop cycle more or less similar to that described in the default FAO potato file (recovered = 15 DAS, maximum canopy cover = 55 DAS, senescence = 70 DAS, maturity = 120 DAS). The entire soil profile is at field capacity at planting time. Determine for year 2017 the total net irrigation requirement and corresponding potato yield.

· Crop: Potato.CRO
· Sowing date: 1 May
· Soil: Tal Amara.SOL
· Initial soil water conditions (1 May): soil profile at field capacity

Steps
- Create a net irrigation requirement file for potato in Tal Amara (threshold = 80% RAW).
- Create a project in AquaCrop and load the necessary climatic, crop and soil files.

Files required
Tal Amara.CLI
Potato.CRO Tal Amara.SOL

Files produced

PotatoTalAmara.CRO PotatoTalAmaraNet.IRR PotatoTalAmaraNet.PRM TalAmaraFC.SW0

Year	Potato	
	Net Irrigation Requirements (mm)	Yield (ton.ha-1)
2017		
2018		

Practical Exercise on PC

Generation of irrigation schedule

6

Environment
Location: Tal Amara, Lebanon

Assignment
Generate an irrigation schedule for maize in the region of Tal Amara. Maize crop is characterized by a crop cycle shorter than that described in the default FAO maize file (recovered = 6 DAS, maximum canopy cover = 54 DAS, senescence = 107 DAS, maturity = 120 DAS). Assume that the crop is sown on 1 May on a local soil. The entire soil profile is at field capacity at sowing. Determine for year 2017, irrigation requirement and corresponding yield. Irrigate back to field capacity when 20% RAW is being depleted. The crop is drip irrigated.

· Climate: Tal Amara.CLI
· Crop: Maize.CRO
· Start simulation on 1 May
· Initial soil water conditions: soil profile at field capacity
· Soil: Tal Amara.SOL

Steps
- Create a project in AquaCrop and load the necessary climatic, crop and soil files.

Files required
Tal Amara.CLI
Maize.CRO Tal Amara.SOL

Files produced
MaizeTalAmara.CRO TalAmaraNet.IRR MaizeTalAmaraNet.PRM

Year	Maize	
	Irrigation Requirements (mm)	Yield under irrigation (ton.ha-1)
2017		
2018		

Practical Exercise on PC

Generation of irrigation schedule under different irrigation methods

7

Environment
Location: Tal Amara, Lebanon

Assignment
Generate an irrigation schedule for tomato in the region of Tal Amara during the growing season of year 2017. Tomato crop is characterized by a crop cycle similar to that described in the default FAO tomato file (recovered = 4 DAS, maximum canopy cover = 63 DAS, senescence = 91 DAS, maturity = 110 DAS). Assume that the crop is grown on 1 June on a local soil. Irrigation is done back to field capacity when 50% RAW is being depleted.
Determine the irrigation requirements and corresponding yield for a drip irrigated tomato then for a surface irrigated crop

· Climate: Tal Amara.CLI
· Crop: Tomato.CRO
· Start simulation on 1 June
· Initial soil water conditions: field capacity

Files required
Tal Amara.CLI
Tomato.CRO
TalAmara.SOL

Files produced
TomatoTalAmara.CRO TomatoTalAmaraNet.IRR